Docket No.: M1071.1855

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:

Katsuhiro Horikawa et al.

Application No.: 10/624,537 | Confirmation No.: 6662

Filed: July 23, 2003 | Art Unit: 1734

For: MANUFACTURING METHOD FOR MONOLITHIC PIEZOELECTRIC PART, AND MONOLITHIC PIEZOELECTRIC PART | Examiner: M. C. Mayes

REPLY BRIEF

This short reply brief is being submitted in order to response to some of the assertions made in the Examiner's Answer. Matters discussed in the Appeal Brief will not be repeated.

The present invention is based on the fact that a lead perovskite piezoelectric ceramic having a high piezoelectric d constant, which reflectes the amount of mechanical strain produced by an applied electric field and which is required in certain monolithic piezoelectric parts, such as monolithic piezoelectric actuators and/or audio emitters, can be achieved if the lead perovskite has the recited formula and it is sintered in a reduced oxygen atmosphere. This result is surprising and unpredictable since it was previously known that when a piezoelectric ceramic was a lead perovskite type material, the piezoelectric d constant conspicuously deteriorated when that lead perovskite ceramic was sintered in a low oxygen concentration atmosphere. It is striking that other than a brief acknowledgment that applicant has made arguments

with regard to the piezoelectric d constant (at page 11), the Examiner's Answer totally ignores the expected deterioration. The Examiner's Answer does not attempt to contest or question the fact that the deterioration of the piezoelectric d constant can be combated by observing the requirements of the instant claims is surprising, unexpected and unpredictable. It simply ignores that unobvious result.

The rejections advanced in this case are based on selecting isolated teachings from the various references and combining them. While that, of course, is proper in the appropriate circumstances, it does not allow one to ignore the context in which the references have the teachings relied upon nor the fact that solving one problem may lead to the creation of other problems. These considerations have particular applicability in this Appeal.

The Horikawa '328 reference is relied upon to show the molar quantity of the lead in the A site of the perovskite can be reduced. The rejection ignores the fact that the A site quantity can be stoichiometric (x=1) or even be increased (x>1 up to 1.05), thus indicating the quantity is not a result effective variable, an effect the patent attributes to the presence of a secondary Cu component. There is nothing in the patent which suggests whether reducing the oxygen content has any effect on the d constant. Accordingly, it provides no basis for predicting the d constant can be effected in any way by changing the molar quantity of the A site element and by having the valence of the B site component greater than that of the stoichiometric composition and being greater than 4.000 and less than 4.10 and by controlling oxygen content during sintering.

JP '511 is relied on to show the use of sintering in a low oxygen atmosphere addresses a silver diffusion problem, as acknowledged in the opening paragraphs of this application, but any such reliance ignores the fact that it is well known that

lowering the oxygen concentration when sintering a lead perovskite piezoelectric ceramic containing internal silver electrodes causes a marked reduction in the piezoelectric d constant and that the ceramic of this reference is not a lead based perovskite. The data in Table 3 of the present application shows that when a stoichiometric lead perovskite composition containing silver electrode was sintered in a low oxygen atmosphere, the generation of oxygen pores was promoted and the piezoelectric d constant decreased, and could even make the resulting material completely unsuitable for any use. The Examiner's Answer thus asks that JP '511 be used to show the value of using a low oxygen concentration to prevent Ag diffusion in a ceramic which is not a lead based perovskite while ignoring the data which shows that when the ceramic is a lead perovskite, the piezoelectric d constant deteriorates. That would be improper. There is nothing in JP '511 which teaches or suggests that the piezoelectric d constant deterioration can be obviated in a low oxygen concentration sintering if the A/B site composition of the ceramic is altered.

The Examiner's Answer asks that the Horikawa '308 patent be considered as "pertinent to piezoelectric ceramic in general". That also would not be proper since the element in this reference did not have any internal electrodes, which JP '511 teaches causes problems, nor was a reduced oxygen atmosphere used, which the record shows causes deterioration of lead perovskites containing internal silver electrodes. Those teachings cannot be ignored when considering what this reference teaches one skilled in the art.

The submission, for the first time, of a full translation of two Japanese references relied upon is noted but those full translations do not alter the comments made about those references either in the Appeal Brief or herein.

The rejections of the claims on Appeal are untenable and should be reversed.

Dated: October 1, 2007

Respectfully submitted,

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